Device and method for detecting a momentary distance between a motor vehicle and an obstacle

The invention relates to a device for detecting a momentary distance between a motor vehicle and an obstacle according to the preamble of claim 1, and also to an associated method according to the preamble of claim 8.

Devices of the generic type are known, for example, by the designation "Parktronic" for the applicant. Such a device can be used to facilitate maneuvering for the driver of the vehicle in restricted traffic conditions with poor visibility, in particular when parking, by virtue of the fact that the driver is warned about obstacles which are located in his direction of travel and whose distance from the vehicle is smaller than a predefined limiting distance. Such obstacles may be, for example objects which are lying around or else moving obstacles such as other road users.

DE 198 47 013 A1 discloses a parking assistance system for a vehicle which comprises a measuring device for measuring the momentary distance between the vehicle and an obstacle, an evaluation device and a warning signal transmitter. The evaluation device compares a distance signal which has been output by the measuring device with a distance limiting value, the warning signal transmitter generating a warning signal, which can be perceived by a driver of the vehicle, as long as the distance signal exceeds the distance limiting value. According to one predefined function of the movement state of the vehicle, the evaluation device

defines the distance limiting value dynamically in this context. As a result it also provides the driver even at a relatively high velocity with the reaction time which is necessary in order to bring the vehicle reliably to a stop before the obstacle.

DE 199 01 847 A1 discloses a method as a device for detecting objects, in particular as a parking assistance device in a motor vehicle. The device comprises a number of distance sensors, at least one microcontroller which actuates the distance sensors, and an output unit, it being possible for the microcontroller to apply an identifier which varies over time to the distance sensors. By applying this identifier which is variable over time to the distance sensors it is possible to assign the received signals reliably to the sources in uniquely defined fashion. As a result the risk of the distance measurement being adversely affected, as a result of, for example, transmitted signals from distance sensors of other vehicles, is reduced.

WO 98/20364 discloses a method for distance measurement of obstacles from a vehicle using an echo method, preferably an ultrasonic method, in which the transmission signal from the object subject to radiation is bounced back to the vehicle in the form of an echo and a warning signal is triggered in the vehicle during a chronological listening window as a function of the threshold value of the receiver. The chronological position and/or the duration of the transmission signal and/or the variation of the threshold value over time during the listening window depend on the data of the vehicle. If, for example, the front wheels of the vehicle are locked by a specific angle, it is not necessary to measure in the remote

region on the side of the vehicle which will not reach this remote region owing to the angular position of the wheels. In this case, the listing window can end earlier. However, the vehicle movement dynamic data of the vehicle can also be used to change the measuring parameters of the distance measurement. The described method is conceived specifically for gating out undesired echoes in the direct proximity of the motor vehicle. For this reason, for example the sensitivity of an electro-acoustic transducer can be adapted to the surface on which the vehicle is traveling or to attachments of the motor vehicle such as a trailer hitch.

WO 99/32318 discloses a regulating system for the velocity and distance when a motor vehicle changes lane. In a distance-related velocity-regulating system for motor vehicles with an electronic control unit, the electronic control unit registers at least one signal for detecting a change of lane or a request for a change of lane from the instantaneous lane to a target lane and at least one signal for estimating the average velocity of vehicles on the target lane. In the case of a change of lane or request for a change of lane, the control unit prescribes the vehicle velocity and/or the distance from the vehicle traveling ahead on the momentary lane, in accordance with this average velocity.

EP 1 318 491 A1 discloses a method for detecting obstacles which are located ahead of a vehicle, by adapting the predicted lane width as a function of navigation system data. As a result, the vehicle behavior is improved within the scope of a velocity control system.

DE 199 34 670 A1 and WO 03/064215 A1 disclose an object detection system having a plurality of detectors with different detection ranges. Each of the detectors has a permanently assigned monitored area. The detection range of a detector is not controlled. Instead, a decision is made as to which objects are to be considered irrelevant, on the basis of the collected data.

DE 101 49 146 A1 discloses a velocity regulator with a distance function for motor vehicles having a locating system for detecting the locating data for objects which are located ahead of the vehicle, having an evaluation device for deciding whether a located object is to be treated as a relevant target object on the vehicle's own lane. The sensors are operated with constant power so that their power is not controlled by the locating system.

The present invention is therefore concerned with the problem of specifying, for a device of the type mentioned at the beginning, an improved embodiment which improves, in particular, the comfort of the device and thus its acceptance in order to increase the traveling safety.

This object is achieved by means of the subject matters of the independent claims, and advantageous refinements form the subject matter of the dependent claims.

The invention is based on the general idea of constructing a control unit of a device for detecting a momentary distance between a motor vehicle and an obstacle in such a way that said control unit can calculate a driving path, to be traveled through in future by the motor vehicle, using dynamic vehicle

data, and in addition is able to differentiate relevant obstacles which are located within the driving path from irrelevant obst